Tennessee Valley Authority, Post Office Box 2000, Spring City, Tennessee 37381-2000

EA-03-009

DEC 1 0 2003

10 CFR 50.54(f)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

In the Matter of) Docket No.50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - NRC ORDER EA-03-009 - INTERIM INSPECTION REQUIREMENTS FOR REACTOR PRESSURE VESSEL HEADS (TAC NO. MB 7667) AND BULLETIN 2003-02 - LEAKAGE FROM REACTOR PRESSURE VESSEL LOWER HEAD PENETRATIONS AND REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY (TAC NO. MC 0576)

The purpose of this submittal is to provide the inspection results of WBN's Unit 1 reactor pressure vessel (RPV) closure (upper) head and lower head penetration nozzles and head surfaces. The subject NRC Order, Item IV.C.(3) for plants that fall within the low susceptibility category and the subject Bulletin required a bare metal visual inspection of 100 percent of the RPV head and lower head surfaces (including 360 degrees around each RPV penetration nozzle). Item IV.E of the Order and Item 2 of the Bulletin required that the Licensee submit a report detailing the inspection results within sixty days after returning the plant to operation.

The RPV closure head and lower head inspections were performed during the WBN Unit 1 Cycle 5 outage which ended October 20, 2003. Bare metal visual inspections were performed on the heads by Level III Visual Testing (VT) certified personnel using video equipment mounted on remote magnetic crawlers. The examinations were recorded on video cassettes for archival and off-line review. Enclosure 1 provides excerpts from Report No. R0922 entitled, "Watts Bar Unit 1, Cycle 5 Reactor Pressure Vessel Closure Head and Lower Head Remote Visual (VT-2) Penetration

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Examination" which documents the complete inspection of the closure head and lower head. Items from the report which are not included in this submittal are copies of the NRC Order and the NRC Bulletin, documentation of Pre-job briefings, inspection procedures, VT certifications, and other supporting documentation. The original report including the video cassettes of the remote video scan paths, photographs, and resolution verification, is filed as a life of plant document with the Cycle 5 Inservice Inspection Summary Report.

Inspection results of the closure head indicated no observed boron leakage in the examination area of each head penetration. The penetration annulus areas and the head surface in the area on the penetrations were examined and recorded. Boron was discovered on Penetration 60, but was concluded to be from a canopy seal weld leak previously identified and repaired during the Cycle 1 refueling outage. This condition was documented on a problem evaluation report and evaluated under the TVA Corrective Action Program. The source of boron was from above the penetration, with no evidence seen to indicate the penetration annular area as the source. The area was cleaned and a liquid penetrant examination was performed on the nozzle surface resulting in no indications. Enclosure 2 provides a copy of the engineering evaluation. Details of the closure head visual examination are summarized in Enclosure 1.

Inspection results of the lower head indicated no observed boron leakage in the examination area of each bottom mounted penetration. The penetration annulus areas and the head surface in the area on the penetrations were examined and recorded. Light to moderate staining and surface rust was seen around the annular area and on the bare surface. These areas had trails from above the lower head. The condition was not associated with boron leakage from the bottom mounted penetrations. This condition was documented on a problem evaluation report and evaluated under the TVA Corrective Action Program. Two areas on the head were cleaned. The surface was observed to be smooth after cleaning and based upon the ease of removal of the substance, it was determined that there is very little rust on the vessel lower head itself. Enclosure 3 provides a copy of the engineering evaluation. Details of the lower head visual examination are summarized in Enclosure 1.

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There are no regulatory commitments in this letter. If you have any questions about this report, please contact me at (423) 365-1824.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 10th day of December 2003.

Sincerely,

P. L. Pace
Manager, Site Licensing
and Industry Affairs

Enclosures
1. Excerpts from Report No. R0922 - Reactor Pressure Vessel Closure Head and Lower Head Remote Visual (VT-2) Penetration Examination - Final Report - September 2003.
2. Engineering Evaluation of Reactor Head Examination.
3. Engineering Evaluation of Reactor Lower Head Surface Rust.

cc (Enclosures):
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ENCLOSURE 1

WATTS BAR NUCLEAR PLANT UNIT 1
NRC ORDER EA-03-009 AND BULLETIN 2003-02
REACTOR PRESSURE VESSEL CLOSURE HEAD AND LOWER HEAD INSPECTION
REPORT NO. R0922 CYCLE 5 EXCERPTS

ISO

Watts Bar Unit 1, Cycle 5 – RPV Closure Head REPORT
Remote Visual (VT-2) Penetration Examination Final Report

Visual Examination Report Summary

INTRODUCTION

During the Watts Bar Unit 1 (WBN-1), Cycle 5 Refueling Outage, remote visual (VT) examinations were performed on the outside surface of the Reactor Pressure Vessel (RPV) Closure Head and penetrations. The examinations were performed from September 16 to 19, 2003 by Tennessee Valley Authority's (TVA's) Inspection Services Organization (ISO) and R.O.V. Technologies. Any suspect areas were also reviewed by a TVA Metallurgical Engineer.

SUMMARY

The VT examinations were accomplished to address the integrity of the RPV closure head penetrations, including the Control Rod Drive mechanisms (CRD's), Upper Head Injection (UHI) and the Vent line. A total of 83 penetrations were examined, including (78) CRD's, (4) UHI's and (1) Vent line. The examinations were performed to address NRC Order EA-03-009, "Interim Inspection Requirements for Reactor Pressure Vessel Heads At Pressurized Water Reactors". The examination scenario was aimed at determining whether boric acid deposits were emanating from the annulus of the penetrations and identifying the presence of boric acid deposits on the RPV head. The annulus area is defined as the intersection between the RPV head and penetration, inclusive of ½ inch of adjacent RPV head base material.

The examination was implemented through WBN Work Order # 02-004615-000. The examination fulfills the 1-TRI-0-10, revision 10, augmented examination plans for U1C5. In addition, the examination fulfills NRC Order EA-03-009, Section 3 (a), Bare Metal Visual Examination of 100% of the RPV head penetration nozzles and surrounding head surface.

TECHNICAL DISCUSSION

Remote VT Equipment

TVA contracted with R.O.V Technologies to provide remote VT equipment to examine the RPV head penetrations. The work was performed in accordance with TVA's ISI Program, 1-TRI-0-10 revision10. The remote examinations were performed with R.O.V. magnetic crawlers, outfitted with twin high resolution color cameras, each having adjustable LED lighting arrays. The cameras were located on the front and rear of the remote crawlers.

Access to the examination area was obtained by lifting the insulation shroud approximately 5 inches from the vessel head and installing temporary wooden wedges for stabilization. The remote crawler was installed on the head surface and guided between the rows of penetrations.

The examinations were recorded on SVHS video cassette's for archival and off-line review. All penetration annulus areas and the head surface in the area on the penetrations were examined and recorded.

Procedure/Documentation

ISO provided Level III's certified in Visual examination to review and evaluate all data on-line. All acquired data also had an independent review by certified Level III VT examination personnel. Examination protocol was designed to incorporate the recommendations of the Electric Power Research Institute's (EPRI) Technical Report, entitled "Visual Examination for Leakage of PWR Reactor Head Penetrations on Top of RPV Head", Revision 2 of 1006296, including 2002 Inspection Results. Key technical elements were incorporated into TVA's Nondestructive Examination (NDE) Procedure N-VT-17, Revision 3, "Visual Examination for Leakage of PWR Head Penetrations".

The visual examination process utilized enhanced VT-2 methodology with camera resolution established on characters less than or equal to .105" high, representative of VT-3 sensitivity (Ref: Section 4, Figure 1).

Examination Process

An examination Scan Plan (Section 3.0) was developed in order to ensure that examinations were performed in a logical sequence, while minimizing radiation exposure and validating positional accuracy. A raster pattern was chosen as the most effective method for performing the examinations and consisted of 22 separate scans.

A total of 323 sequences were performed to examine all penetrations. With the exception of the outer scan rows, each penetration was examined during two scans which consisted of examining four, 90-degree + segments of each penetration to ensure 100% coverage of the annulus area. The outer scan rows, that included the peripheral penetrations, were examined using two scans that covered 180-degrees + of the penetration that resulted in 100% coverage. During the examination of each penetration, the head area adjacent to the penetrations was also visually examined for boron deposits.

Radiation work permit (RWP) number 9070 was used for the inspection work. The data acquisition equipment staging area was located on top of Reactor Coolant Pump Plug No. 2 in a low dose area.

RESULTS

Examination results for each penetration are contained in Section 3.0. General information relative to the results of the examinations is provided below:

Canopy Seal Weld Leak

Prior to the commencement of examinations, the examination team was apprised of a previous leaking Canopy Seal Welds identified as "G-15, F-2, and G-5" that were detected during Cycle 01 of 1997 and Cycle 02 of 1998. The Canopy Seal welds were located above CRDM No. 62, 60 and 13 respectively. During this exam, penetration number 60 was identified as having boron deposits on the nozzle O.D surface and on the head. This condition was documented on WBN PER # 03-016293-000. The source of the boron was from above the penetration joint, with no evidence seen to indicate the penetration annular area as the source (Ref: Section 4, Figures 2, 3, 4 and 5). The original Canopy Seal Weld leak was repaired on WBN Work Order 97-013542-001. Boron samples were obtained, the area cleaned, and a Liquid Penetrant (PT) exam was performed on the nozzle surface (Ref: WBN Work Order Number 03-016329-000 and ISI Report Number R-0884). Section 4, figures 6 and 7 contain images of the PT exam and the post exam cleaning condition.

Insulation Ring Interference

Some penetrations had insulation support rings that had moved down the penetration and were resting on the penetration to head area. Although the annulus region was partially restricted, no evidence of boron was noted outside the insulation collar. This condition was noted at locations on the crest of the head where the insulation surface is closest to the RPV head surface (Ref: Example shown in Section 4 Figure 8). Although the insulation rings were present in isolated cases, they did not limit the VT-2 examination for the detection of boron leakage.

RPV Head Coating

The RPV Head surface, and exam area were seen to have a coating substance resembling paint. This coating was also seen on the penetration surface adjacent to the head, indicating over run during application. The manufacturer had coated the head at the factory with a coating named Carboline 4674. The condition of the coating varied from tightly adhering, chipped, and to flaking off. (Ref: Section 4, Figures 9, 10, 11 and 12). Engineering was notified of the condition.

Irrelevant Indications

In isolated cases, CRDM's displayed a faint boron appearance "streaking" on the sides of the penetrations, away from the annulus area. These faint areas were either horizontal or vertical with origination from above. The horizontal areas appeared to have been deposited by high velocity air in the plenum, during operation. The condition was <u>not</u> associated with boron originating from the annulus. An example of this condition is depicted in Figures 13 and 14 (CRDM No. 64).

Foreign Material

Foreign material was noted on the head surface in two areas at the penetration annular junction. In both locations the material was retrieved by R.O.V. using remote gripping devices. After removal, the newly uncovered area was examined and recorded. Table 1 lists the types of foreign material that were seen during the examinations.

TABLE 1

CRDM Identification	Figure Number	Description
63	15 & 16	Partial hose clamp strap
67	17 & 18	Drill bit tip

In general, the head surface was relatively free from debris. The heaviest concentrations were seen on the uphill side of periphery penetrations and were easily removed by blowing air onto the area. The materials did not preclude an effective examination of the annulus regions of the penetrations.

CONCLUSION

There were no observed indications of boron leakage in the exam area of each penetration. After cleaning at penetration 60, there was no evidence of boron on the RPV Head surface.

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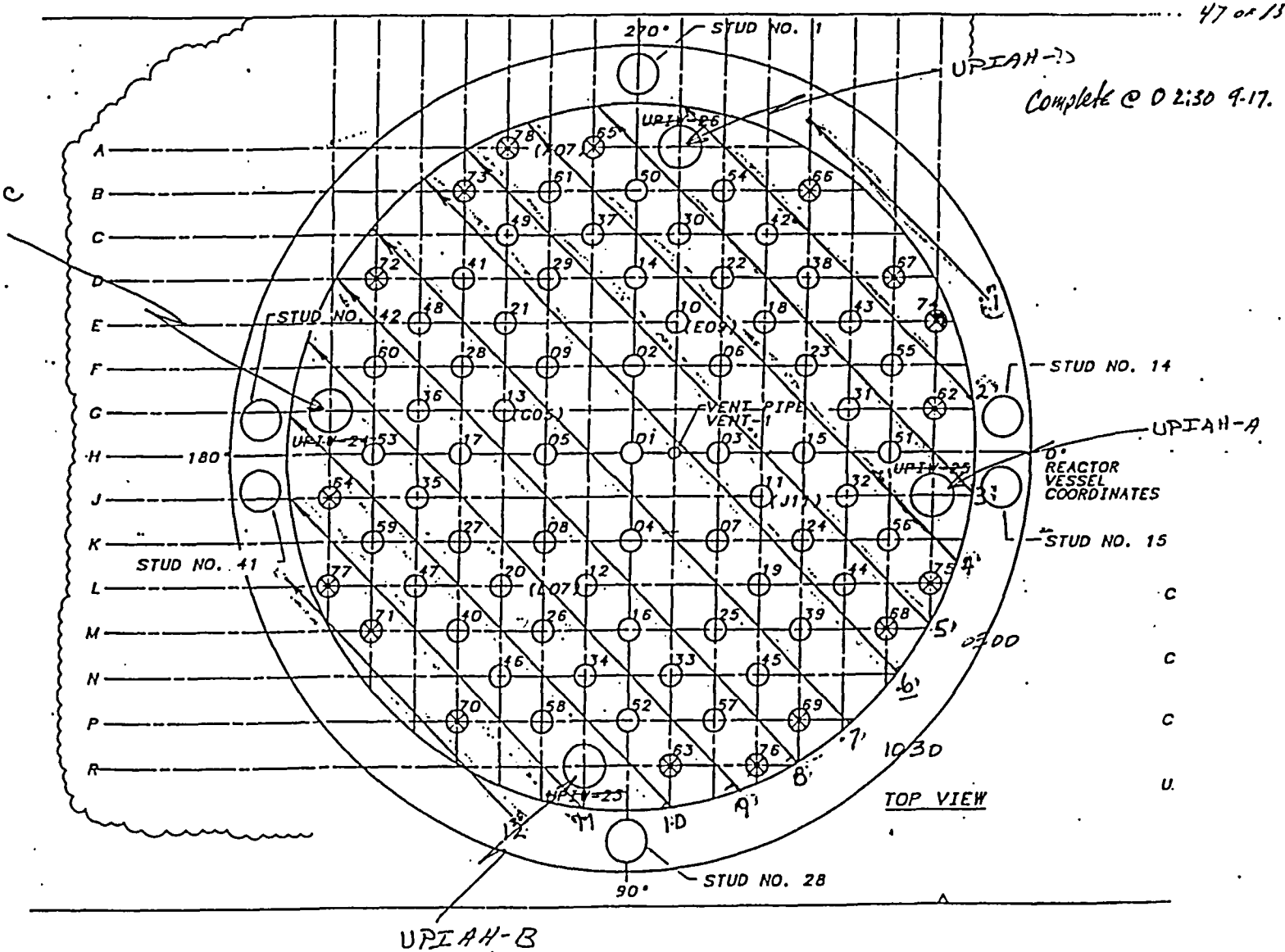
PASS 1.
1 THRU 12.



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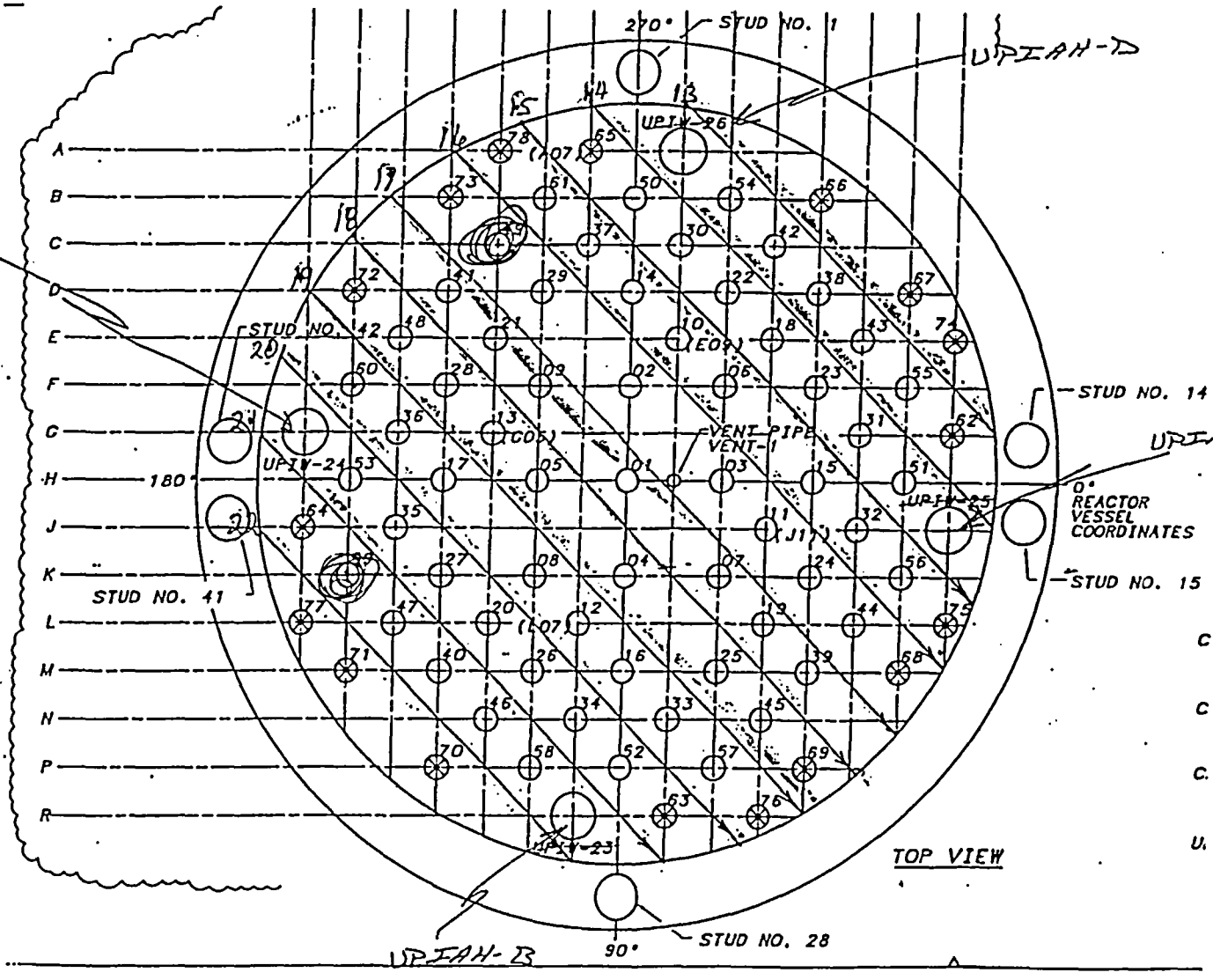
PASS 2.
13 THRU 22.

Complete



Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
1	74	L-180	2	0:21:20									X	FCL	
1	67	L-180	2	0:24:25									X	FCL	Video image ID is 74. Audio correct
1	66	L-180	2	0:25:35									X	FCL	
2	62	L-90	2	0:28:36									X	FCL	
2	55	L-90	2	0:29:48									X	FCL	
2	74	R-90	2	0:31:05									X	FCL	
2	43	L-90	2	0:32:22									X	FCL	
2	67	R-90	2	0:33:28	X								X	FCL	Debris- drill bit tip
2	38	L-90	2	0:34:10									X	FCL	
2	42	L-90	2	0:35:35									X	FCL	
2	66	R-90	2	0:37:20									X	FCL	
2	54	L-90	2	0:38:15									X	FCL	
2	UPIAH-D	L-90	2	0:39:03									X	FCL	
3	UPIAH-A	L-90	2	0:40:07									X	FCL	
3	51	L-90	2	0:41:33									X	FCL	
3	62	R-90	2	0:43:17				X					X	FCL	Very Light
3	31	L-31	2	0:44:00									X	FCL	
3	55	R-90	2	0:45:00									X	FCL	
3	23	L-90	2	0:46:00									X	FCL	
3	43	R-90	2	0:47:03									X	FCL	
3	18	L-90	2	0:47:48									X	FCL	
3	38	R-90	2	0:48:40									X	FCL	No audio
3	22	L-90	2	0:50:00									X	FCL	No audio
3	42	R-90	2	0:51:10									X	FCL	
3	30	L-90	2	0:52:05									X	FCL	
3	54	R-90	2	0:54:10									X	FCL	
3	50	L-90	2	0:55:14									X	FCL	
3	UPIAH-D	R-90	2	0:55:58									X	FCL	
3	65	L-90	2	0:56:55									X	FCL	
4	75	L-90	2	0:57:43									X	FCL	
4	56	L-90	2	0:58:56									X	FCL	

Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
4	UPIAH-A	R-90	2	1:00:43									X	FCL	No audio
4	32	L-90	2	1:01:14									X	FCL	
4	51	R-90	2	1:01:59									X	FCL	
4	15	L-90	2	1:03:01									X	FCL	
4	31	R-90	2	1:04:30									X	FCL	
4	23	R-90	2	1:05:30									X	FCL	
4	6	L-90	2	1:06:20									X	FCL	
4	18	R-90	2	1:07:25									X	FCL	
4	10	L-90	2	1:08:50									X	FCL	
4	22	R-90	2	1:10:00									X	FCL	
4	14	L-90	2	1:11:06									X	FCL	
4	30	R-90	2	1:12:00									X	FCL	
4	37	L-90	2	1:13:20									X	FCL	
4	50	R-90	2	1:13:55				X					X	FCL	
4	61	L-90	2	1:14:38									X	FCL	
4	65	R-90	2	1:15:33									X	FCL	
4	78	L-90	2	1:17:00									X	FCL	
5	68	L-90	2	1:19:01									X	FCL	Video image ID is 75. Audio correct
5	75	R-90	2	1:20:00									X	FCL	
5	44	L-90	2	1:21:59									X	FCL	
5	56	R-90	2	1:22:22									X	FCL	
5	24	L-90	2	1:23:53									X	FCL	
5	32	R-90	2	1:25:01									X	FCL	
5	11	L-90	2	1:26:10									X	FCL	
5	15	R-90	2	1:26:45									X	FCL	
5	3	L-90	2	1:27:50									X	FCL	
5	6	R-90	2	1:28:54									X	FCL	
5	2	L-90	2	1:30:00									X	FCL	
5	10	R-90	2	1:31:17									X	FCL	
5	14	R-90	2	1:32:44									X	FCL	
5	29	L-90	2	1:33:45	X								X	FCL	

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Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
5	37	R-90	2	1:35:36	X								X	FCL	
5	49	L-90	2	1:36:31									X	FCL	
5	61	R-90	2	1:37:55									X	FCL	
5	73	L-90	2	1:38:42									X	FCL	
5	78	R-90	2	1:39:55									X	FCL	
6	68	R-90	2	1:40:44									X	MCW	
6	39	L-90	2	1:42:34	X								X	MCW	
6	44	R-90	2	1:43:58									X	MCW	
6	19	L-90	2	1:44:47	X								X	MCW	
6	24	R-90	2	1:47:00									X	MCW	
6	7	L-90	2	1:48:20	X								X	MCW	
6	11	R-90	2	1:49:00	X								X	MCW	
6	3	R-90	2	1:50:40	X	X							X	MCW	
6	Vent-1	360-Deg.	2	1:51:30									X	MCW	
6	1	L-90	2	1:52:00									X	MCW	
6	2	R-90	2	1:55:38	X	X							X	MCW	
6	9	L-90	2	1:57:42									X	MCW	End of tape 2
6	21	L-90	3	0:00:05									X	MCW	Start of tape 3
6	29	R-90	3	0:01:24									X	MCW	
6	41	L-90	3	0:02:24									X	MCW	
6	49	R-90	3	0:04:05									X	MCW	
6	73	R-90	3	0:05:17									X	MCW	
7	69	L-90	3	0:07:30									X	MCW	
7	45	L-90	3	0:08:40									X	MCW	
7	39	R-90	3	0:09:40									X	MCW	
7	25	L-90	3	0:10:50									X	MCW	
7	19	R-90	3	0:12:12									X	MCW	
7	7	R-90	3	0:13:16									X	MCW	
7	4	L-90	3	0:13:51									X	MCW	
7	1	R-90	3	0:15:38									X	MCW	
7	5	L-90	3	0:19:20									X	MCW	

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Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
7	13	L-90	3	0:20:40				X	X				X	MCW	
7	9	R-90	3	0:24:10									X	MCW	
7	28	L-90	3	0:25:20	X				X				X	MCW	
7	21	R-90	3	0:27:13					X				X	MCW	
7	48	L-90	3	0:28:00	X								X	MCW	
7	41	R-90	3	0:29:10									X	MCW	
7	72	L-90	3	0:30:20	X								X	MCW	
8	76	L-90	3	0:32:25									X	MCW	
8	69	R-90	3	0:31:51									X	MCW	Video image is 76. Audio correct
8	57	L-90	3	0:33:54									X	MCW	
8	45	R-90	3	0:34:36									X	MCW	
8	33	L-90	3	0:36:30									X	MCW	
8	25	R-90	3	0:37:55									X	MCW	
8	16	L-90	3	0:38:45									X	MCW	
8	12	L-90	3	0:39:33	X								X	MCW	
8	4	R-90	3	0:41:35	X								X	MCW	
8	8	L-90	3	0:43:22									X	MCW	
8	5	R-90	3	0:45:12					X				X	MCW	
8	17	L-90	3	0:47:10					X				X	MCW	
8	13	R-90	3	0:49:30					X				X	MCW	
8	36	L-90	3	0:51:41									X	MCW	
8	28	R-90	3	0:53:35	X								X	MCW	
8	60	L-90	3	0:55:55	X								X	MCW	
8	48	R-90	3	0:58:00	X								X	MCW	
8	72	R-90	3	1:00:00	X								X	MCW	
9	76	R-90	3	1:00:30									X	MCW	
9	63	L-90	3	1:00:41									X	MCW	
9	57	R-90	3	1:03:10									X	MCW	
9	52	L-90	3	1:03:48									X	MCW	
9	33	R-90	3	1:04:24									X	MCW	
9	34	L-90	3	1:05:18									X	MCW	

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Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
9	16	R-90	3	1:05:35									X	MCW	
9	26	L-90	3	1:06:24	X								X	MCW	
9	12	R-90	3	1:07:23									X	MCW	
9	20	L-90	3	1:08:35									X	MCW	
9	8	R-90	3	1:09:20									X	MCW	
9	27	L-90	3	1:10:22									X	MCW	
9	35	L-90	3	1:11:40	X								X	MCW	
9	17	R-90	3	1:12:36									X	MCW	
9	53	L-90	3	1:13:30					X				X	MCW	
9	36	R-90	3	1:16:00	X								X	MCW	
9	UPIAH-C	L-90	3	1:16:40									X	MCW	
9	60	R-90	3	1:18:00				X					X	MCW	Boron runs onto head in three trails
10	63	R-90	3	1:29:33									X	MCW	
10	UPIAH-B	L-90	3	1:30:38									X	MCW	
10	52	R-90	3	1:20:47									X	MCW	
10	58	L-90	3	1:25:12									X	MCW	
10	34	R-90	3	1:23:22	X								X	MCW	
10	46	L-90	3	1:26:27									X	MCW	
10	26	R-90	3	1:33:37	X								X	MCW	
10	40	L-90	3	1:35:16									X	MCW	
10	20	R-90	3	1:36:28	X								X	MCW	
10	47	L-90	3	1:38:10									X	MCW	
10	27	R-90	3	1:39:10									X	MCW	
10	59	L-90	3	1:40:56									X	MCW	
10	35	R-90	3	1:42:14									X	MCW	
10	64	L-90	3	1:44:20					X				X	MCW	
10	53	R-90	3	1:47:40									X	MCW	
10	UPIAH-C	R-90	3	1:49:01									X	MCW	
11	UPIAH-B	R-90	3	1:49:50									X	MCW	
11	58	R-90	3	1:50:27									X	MCW	
11	70	L-90	3	1:51:37									X	MCW	

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Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
11	46	R-90	3	1:52:31									X	MCW	
11	40	R-90	3	1:52:55									X	MCW	
11	71	L-90	3	1:54:20									X	MCW	
11	47	R-90	3	1:55:06									X	MCW	
11	77	L-90	3	1:58:03									X	MCW	
11	59	R-90	3	1:59:33									X	MCW	
11	64	R-90	3	2:00:11					X				X	MCW	End of tape 3
12	70	R-180	4	0:00:08									X	MCW	Start of tape 4
12	71	R-180	4	0:01:46									X	MCW	
12	77	R-180	4	0:02:43									X	MCW	Tape residue
13	UPIAH-D	R-90	4	0:05:40									X	MCW	
13	54	R-90	4	0:06:54									X	MCW	
13	66	L-90	4	0:08:00									X	MCW	
13	42	R-90	4	0:09:26									X	MCW	
13	38	R-90	4	0:11:05									X	MCW	
13	67	L-90	4	0:11:55	X								X	MCW	Debris- drill bit tip
13	43	L-90	4	0:14:20									X	MCW	
13	74	L-90	4	0:15:37	X								X	MCW	
13	55	R-90	4	0:17:00									X	MCW	
13	62	R-90	4	0:18:29					X				X	MCW	
14	65	R-90	4	0:19:53									X	MCW	
14	UPIAH-D	L-90	4	0:05:40									X	MCW	
14	50	R-90	4	0:20:49									X	MCW	
14	54	L-90	4	0:21:47									X	MCW	
14	30	R-90	4	0:22:50									X	MCW	
14	42	L-90	4	0:24:00									X	MCW	
14	22	R-90	4	0:24:55									X	MCW	
14	38	L-90	4	0:25:50									X	MCW	
14	18	R-90	4	0:26:26									X	MCW	
14	43	L-90	4	0:27:37									X	MCW	
14	23	R-90	4	0:28:44									X	MCW	

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Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
14	55	L-90	4	0:29:34									X	MCW	Video ID as 23. Audio correct
14	31	R-90	4	0:30:49									X	MCW	
14	62	L-90	4	0:31:00					X				X	MCW	
14	51	R-90	4	0:32:05									X	MCW	
14	UPIAH-A	R-90	4	0:32:40									X	MCW	End of tape 4
15	78	R-90	5	0:01:05									X	FCL	Start of tape 5
15	65	L-90	5	0:01:55									X	FCL	
15	61	R-90	5	0:03:33									X	FCL	
15	50	L-90	5	0:04:38									X	FCL	
15	37	R-90	5	0:05:30									X	FCL	
15	30	L-90	5	0:07:20									X	FCL	
15	14	R-90	5	0:07:55									X	FCL	
15	22	L-90	5	0:08:35									X	FCL	
15	10	R-90	5	0:09:06									X	FCL	
15	18	L-90	5	0:09:39									X	FCL	
15	6	R-90	5	0:10:35									X	FCL	
15	23	L-90	5	0:11:20									X	FCL	
15	31	L-90	5	0:13:04									X	FCL	
15	15	R-90	5	0:13:50									X	FCL	
15	51	L-90	5	0:14:30									X	FCL	
15	32	R-90	5	0:15:00									X	FCL	
15	UPIAH-A	L-90	5	0:16:56									X	FCL	
15	56	R-90	5	0:18:18									X	FCL	
15	75	R-90	5	0:19:06									X	FCL	Tape on CRDM
16	78	L-90	5	0:19:32				X					X	FCL	
16	73	R-90	5	0:21:18									X	FCL	
16	61	L-90	5	0:23:00									X	FCL	
16	49	R-90	5	0:24:00									X	FCL	
16	37	L-90	5	0:24:31									X	FCL	
16	29	R-90	5	0:25:10									X	FCL	
16	14	L-90	5	0:25:50									X	FCL	

Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
16	10	L-90	5	0:26:30									X	FCL	
16	2	R-90	5	0:27:00									X	FCL	
16	6	L-90	5	0:27:50									X	FCL	
16	3	R-90	5	0:28:15									X	FCL	
16	15	L-90	5	0:29:44									X	FCL	
16	11	R-90	5	0:30:19									X	FCL	
16	32	L-90	5	0:30:51									X	FCL	
16	24	R-90	5	0:31:28									X	FCL	
16	56	L-90	5	0:32:00									X	FCL	Boron spots on CRDM
16	44	R-90	5	0:32:58									X	FCL	
16	75	L-90	5	0:33:41									X	FCL	Boron spots on CRDM
16	68	R-90	5	0:34:35									X	FCL	
17	73	L-90	5	0:35:15									X	FCL	
17	49	L-90	5	0:36:12					X				X	FCL	
17	41	R-90	5	0:36:58									X	FCL	
17	29	L-90	5	0:37:48									X	FCL	
17	21	R-90	5	0:38:25									X	FCL	
17	9	R-90	5	0:39:10									X	FCL	
17	2	L-90	5	0:39:46									X	FCL	
17	1	R-90	5	0:40:54									X	FCL	180 Degree vent segment at Tape 5/0:42:20
17	3	L-90	5	0:49:00									X	FCL	
17	11	L-90	5	0:49:38									X	FCL	
17	7	R-90	5	0:50:42									X	FCL	
17	24	L-90	5	0:52:00									X	FCL	
17	19	R-90	5	0:52:45					X				X	FCL	
17	44	L-90	5	0:53:29									X	FCL	
17	39	R-90	5	0:54:48									X	FCL	
17	68	L-90	5	0:55:55									X	FCL	
18	72	R-90	5	0:57:24									X	FCL	
18	41	L-90	5	0:58:26									X	FCL	
18	48	R-90	5	0:59:25									X	FCL	

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Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
18	21	L-90	5	0:59:58									X	FCL	
18	28	R-90	5	1:00:53									X	FCL	
18	9	L-90	5	1:01:27									X	FCL	
18	13	R-90	5	1:01:59									X	FCL	
18	5	R-90	5	1:02:35									X	FCL	
18	1	L-90	5	1:03:38			X						X	FCL	
18	4	R-90	5	1:04:47			X						X	FCL	
18	7	L-90	5	1:05:53			X						X	FCL	
18	19	L-90	5	1:06:44				X					X	FCL	
18	25	R-90	5	1:07:32									X	FCL	
18	39	L-90	5	1:08:45				X					X	FCL	
18	45	R-90	5	1:10:26									X	FCL	
18	69	R-90	5	1:11:27									X	FCL	
19	72	L-90	5	1:12:11									X	FCL	
19	48	L-90	5	1:13:15									X	FCL	
19	60	R-90	5	1:13:55				X					X	FCL	Boron on CRDN from above
19	28	L-90	5	1:16:00									X	FCL	
19	36	R-90	5	1:17:40									X	FCL	
19	13	L-90	5	1:18:26									X	FCL	
19	17	R-90	5	1:19:04									X	FCL	
19	5	L-90	5	1:20:00									X	FCL	
19	8	R-90	5	1:21:12									X	FCL	
19	4	L-90	5	1:22:17									X	FCL	
19	12	R-90	5	1:23:04									X	FCL	
19	16	R-90	5	1:23:52					X				X	FCL	
19	25	L-90	5	1:24:54					X				X	FCL	
19	33	R-90	5	1:25:44									X	FCL	
19	45	L-90	5	1:26:57									X	FCL	
19	57	R-90	5	1:28:09									X	FCL	
19	69	L-90	5	1:29:10									X	FCL	
19	76	R-90	5	1:29:59									X	FCL	

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Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
20	UPIAH-C	R-90	5	1:31:51									X	FCL	
20	60	L-90	5	1:32:12				X					X	FCL	
20	36	L-90	5	1:33:21									X	FCL	
20	53	R-90	5	1:34:19									X	FCL	
20	17	L-90	5	1:35:15									X	FCL	
20	35	R-90	5	1:35:54									X	FCL	
20	27	R-90	5	1:36:37									X	FCL	
20	8	L-90	5	1:37:15									X	FCL	
20	20	R-90	5	1:37:56					X				X	FCL	
20	12	L-90	5	1:38:34									X	FCL	
20	26	R-90	5	1:39:14									X	FCL	
20	16	L-90	5	1:40:19					X				X	FCL	
20	34	R-90	5	1:40:56									X	FCL	
20	33	L-90	5	1:41:50									X	FCL	
20	52	R-90	5	1:42:38									X	FCL	
20	57	L-90	5	1:43:40									X	FCL	
20	63	R-90	5	1:44:40									X	FCL	
20	76	L-90	5	1:46:07	X								X	FCL	Debris-hose clamp section
21	UPIAH-C	L-90	6	0:00:10									X	FCL	End of tape 5
21	53	L-90	6	0:01:25					X				X	FCL	Start of tape 6
21	64	R-90	6	0:02:50									X	FCL	
21	35	L-90	6	0:05:55									X	FCL	
21	59	R-90	6	0:06:59									X	FCL	
21	27	L-90	6	0:08:10									X	FCL	
21	47	R-90	6	0:08:55									X	FCL	
21	20	L-90	6	0:10:33									X	FCL	
21	40	R-90	6	0:11:11									X	FCL	
21	26	L-90	6	0:11:45									X	FCL	
21	46	R-90	6	0:13:20									X	FCL	
21	34	L-90	6	0:14:15									X	FCL	
21	58	R-90	6	0:15:35									X	FCL	

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Watts Bar Unit 1, Cycle 05
RPV Closure Head, Remote Visual (VT-2) Penetration Examination Results

Scan No.	Penetration ID	Location	Tape No.	Tape Count (min:sec)	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
21	52	L-90	6	0:17:00									X	FCL	
21	UPIAH-B	R-90	6	0:17:50									X	FCL	
21	63	L-90	6	0:19:40									X	FCL	
22	64	L-90	6	0:20:14									X	FCL	
22	59	L-90	6	0:21:00									X	FCL	
22	77	R-90	6	0:21:45									X	FCL	
22	47	L-90	6	0:22:36									X	FCL	
22	71	R-90	6	0:23:00									X	FCL	
22	40	L-90	6	0:23:40									X	FCL	
22	46	L-90	6	0:26:11									X	FCL	
22	70	R-90	6	0:25:41									X	FCL	
22	58	L-90	6	0:27:44									X	FCL	
22	UPIAH-B	L-90	6	0:27:54									X	FCL	
	67	N/A	7	0:08:00									X	MCW	After debris removal (drill bit)
	60	N/A	7	0:10:50									X	MCW	General overview
	63	N/A	7	0:23:10									X	MCW	After debris removal (hose clamp)
	60	N/A	8	0:34:00									X	JWW	PT Exam interpretation
	60	N/A	8	0:49:04									X	MCW	PT exam post cleaning
	Frank C. Leonard								Matthew C. Welch						
	Level III, Visual								Level III, Visual						
	Inspection Services Organization								Inspection Services Organization						
	September 19, 2003								Sept. 19, 2003						

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WBN U1C5 RPV UPPER HEAD VISUAL EXAMINATION
SECTION 4 PHOTOS

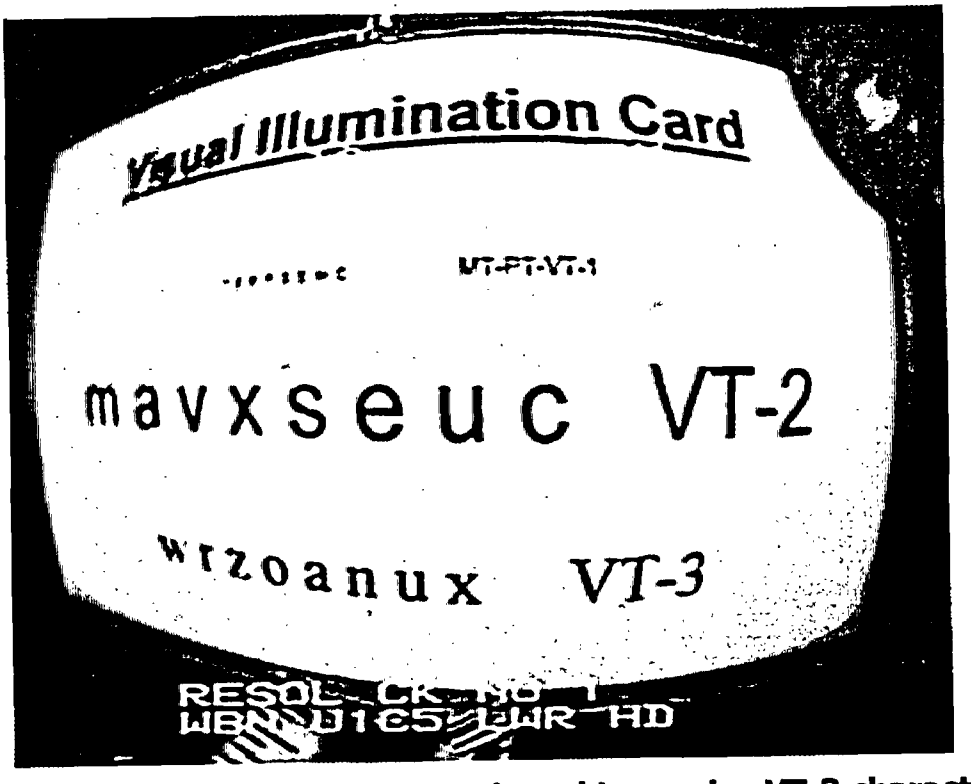

Figure 1: Visual Illumination Card used to resolve VT-3 characters

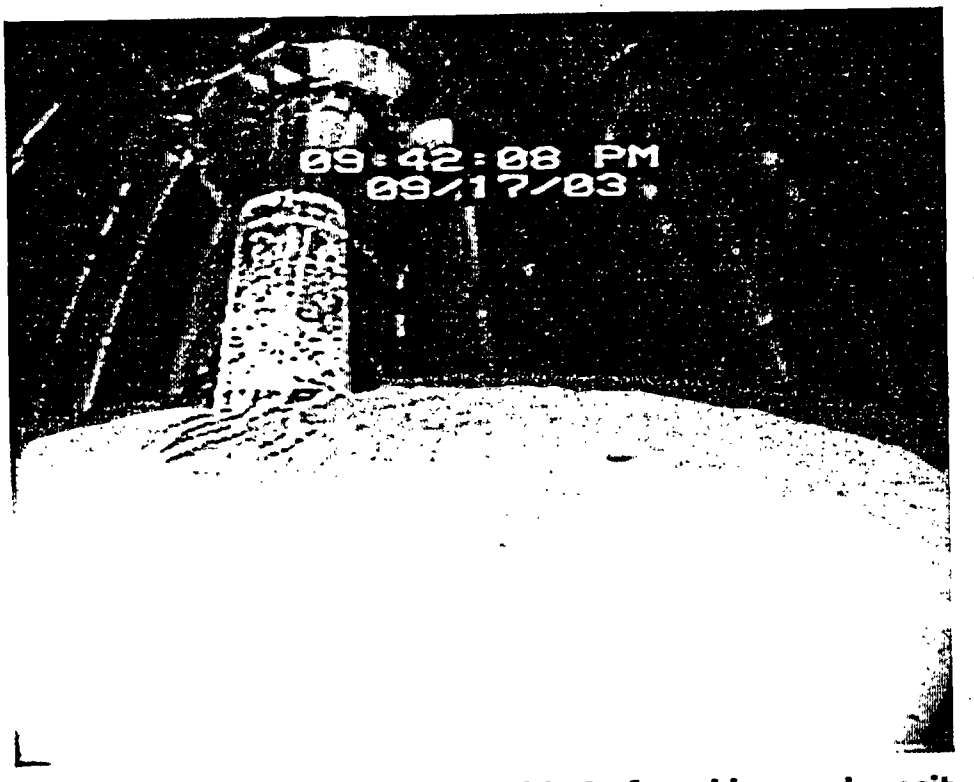

Figure 2: Penetration 60, Scan 20. As found boron deposit

WBN U1C5 RPV UPPER HEAD VISUAL EXAMINATION
SECTION 4 PHOTOS

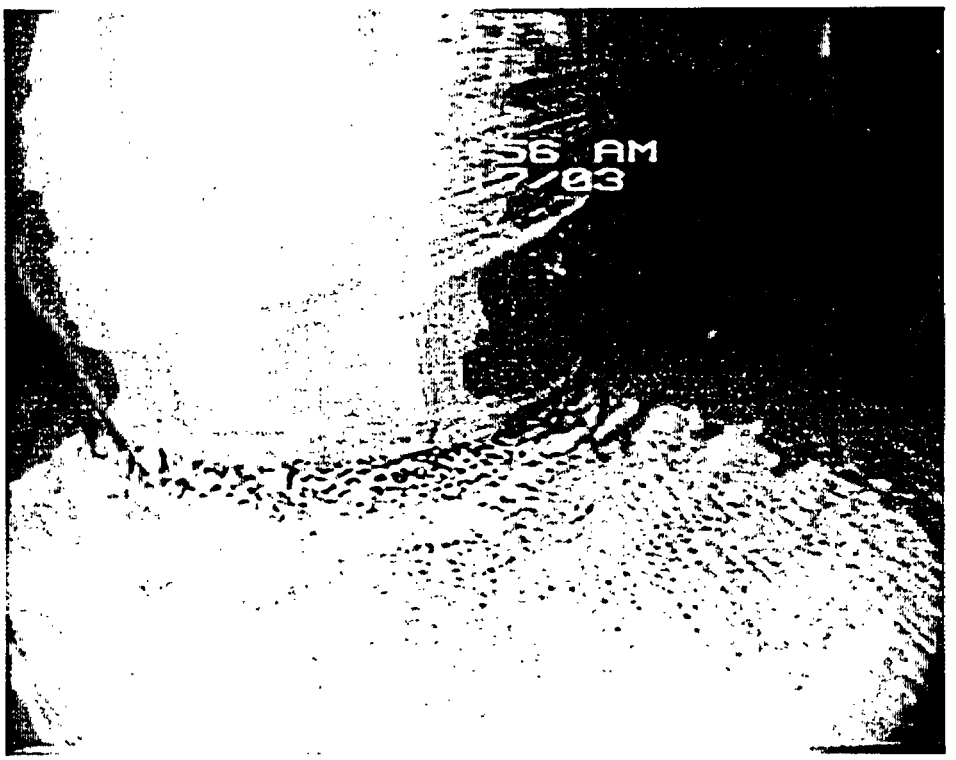

Figure 3: Penetration 60, Scan 8. No visible boron in this view.

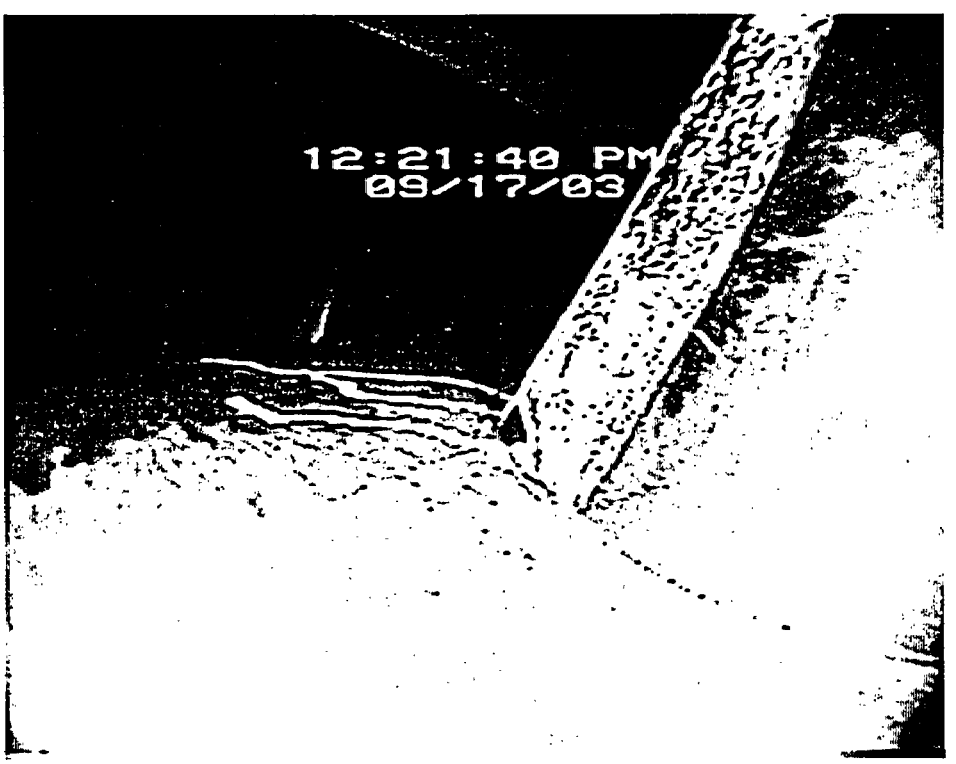

Figure 4: Penetration 60, Scan 9.

WBN U1C5 RPV UPPER HEAD VISUAL EXAMINATION
SECTION 4 PHOTOS

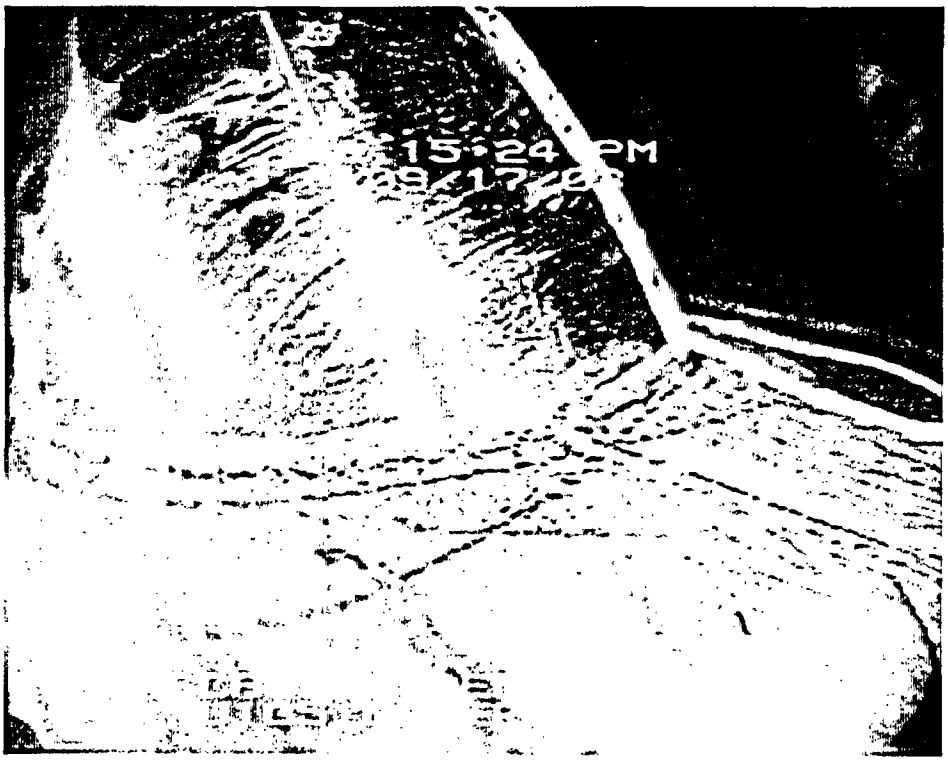

Figure 5: Penetration 60, Scan 19

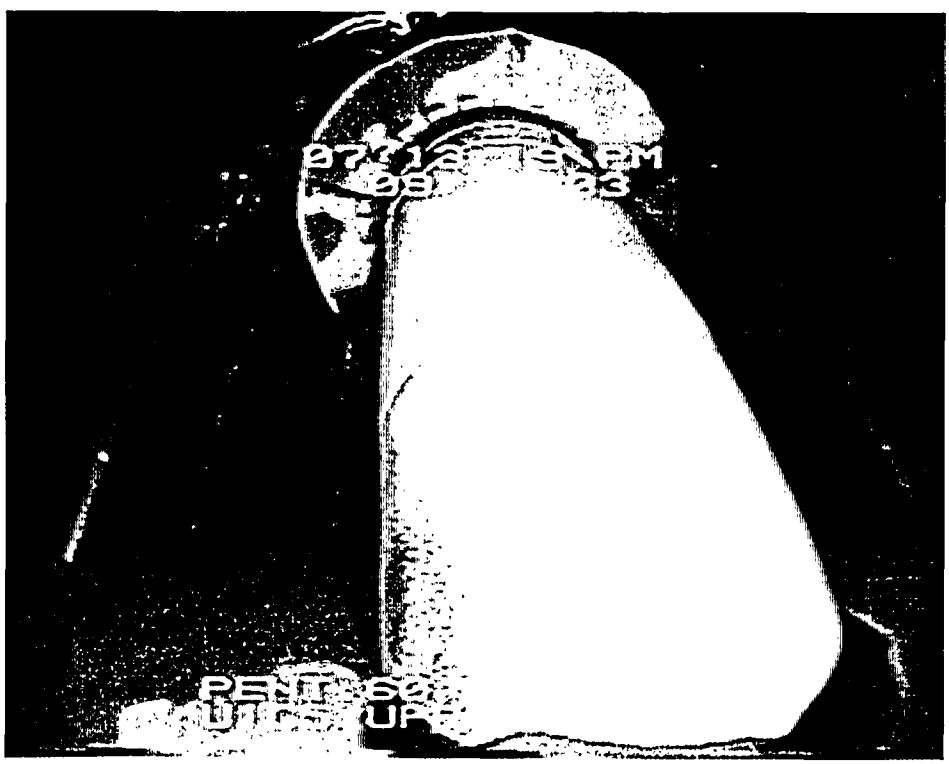

Figure 6: Penetration 60. PT exam, interpretation step.

WBN U1C5 RPV UPPER HEAD VISUAL EXAMINATION
SECTION 4 PHOTOS

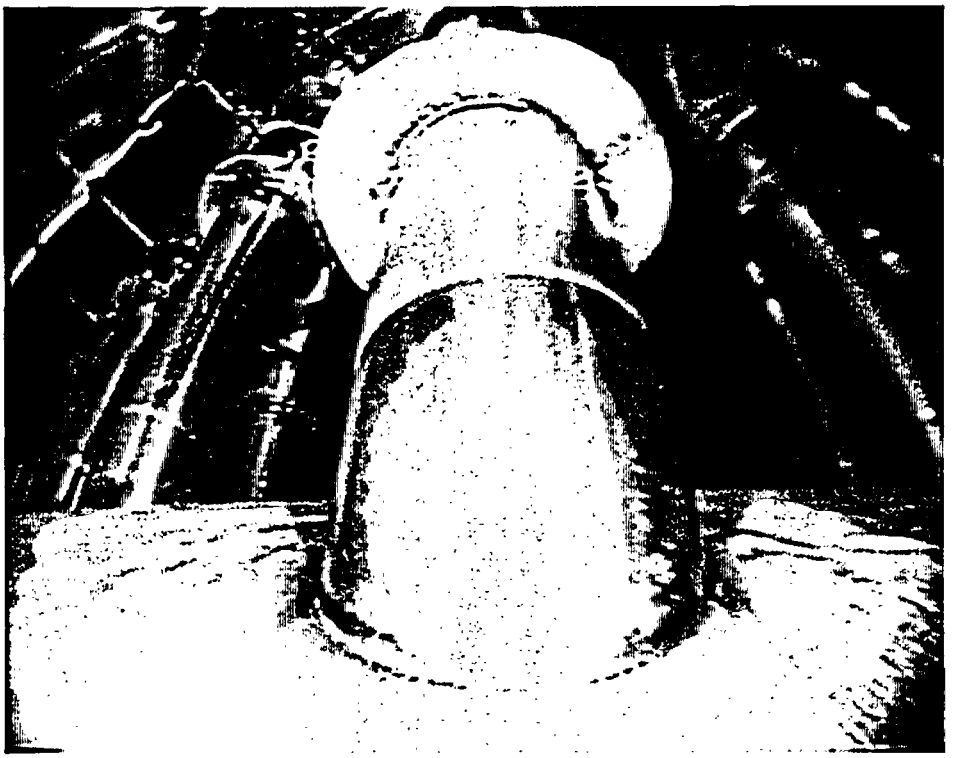

Figure 7: Penetration 60, cleaning after PT exam.

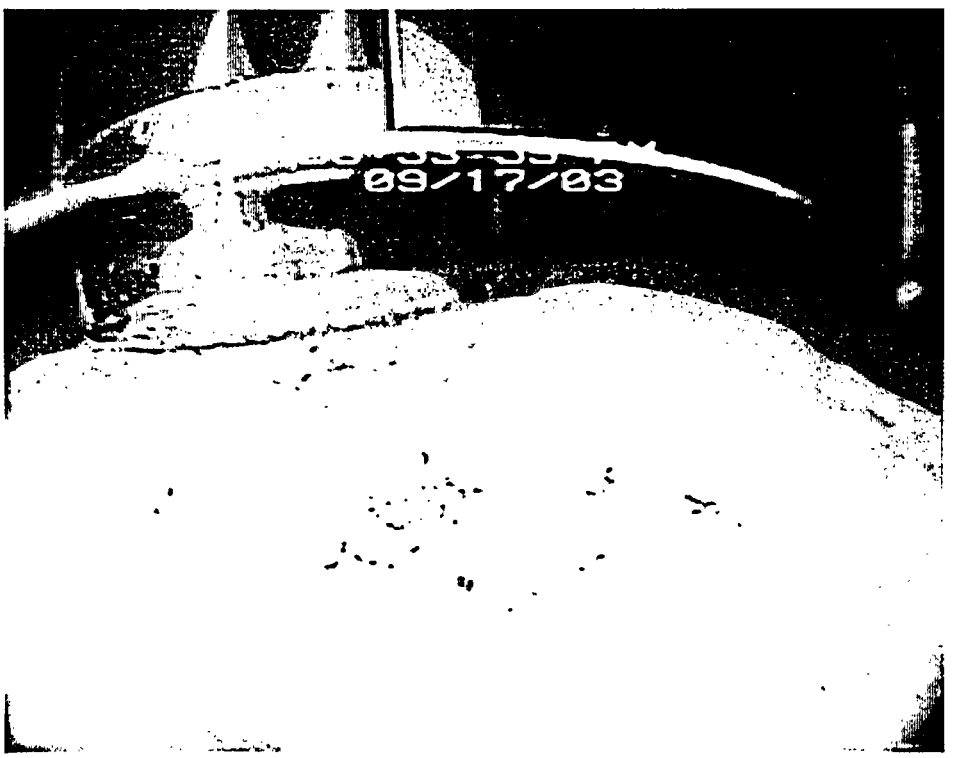

Figure 8: Penetration 1, insulation support ring restriction.

WBN U1C5 RPV UPPER HEAD VISUAL EXAMINATION
SECTION 4 PHOTOS

Figure 9: Penetration 10, scan 16. Coating over run on penetration

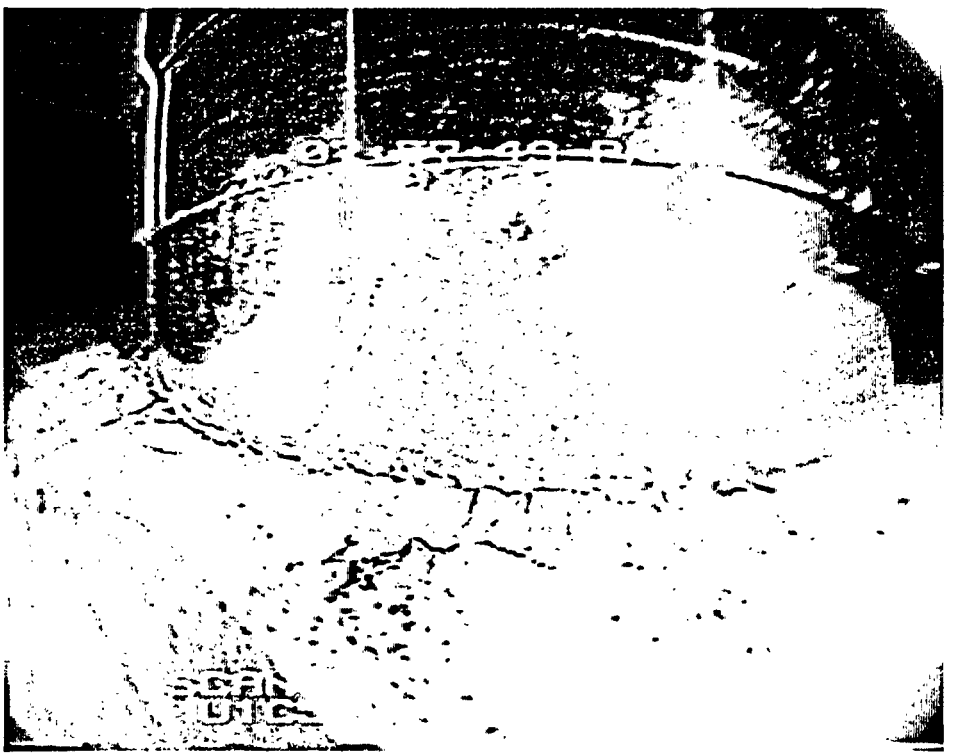

Figure 10: penetration 2, scan 16. Cracked coating at crevice

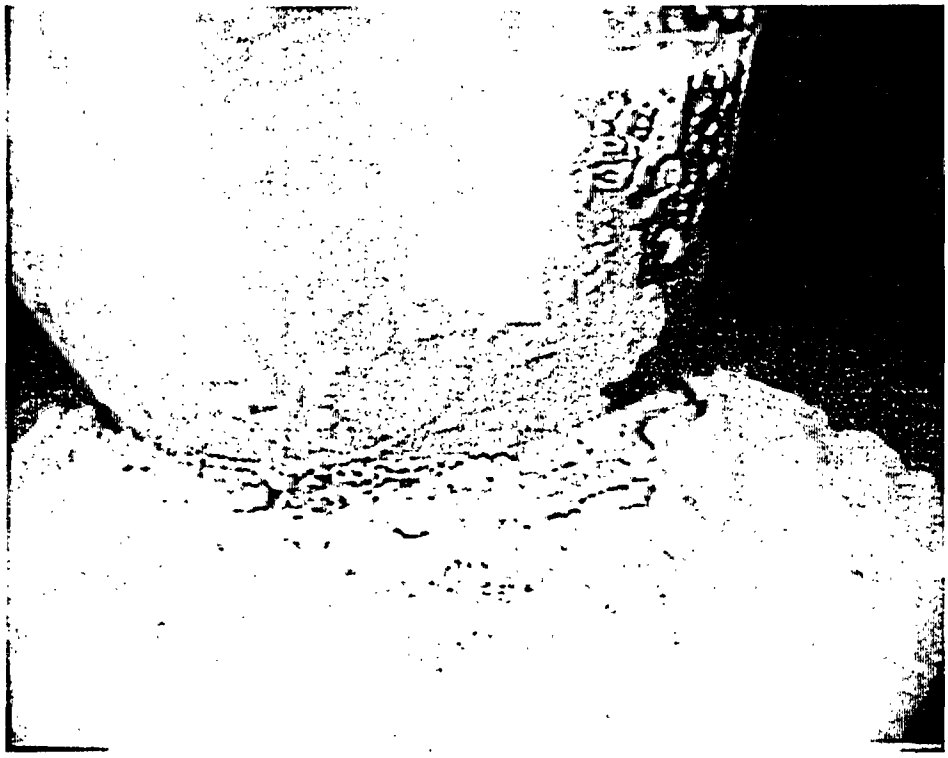

Figure 11: Penetration 56, scan 16. Cracked and chipped coating

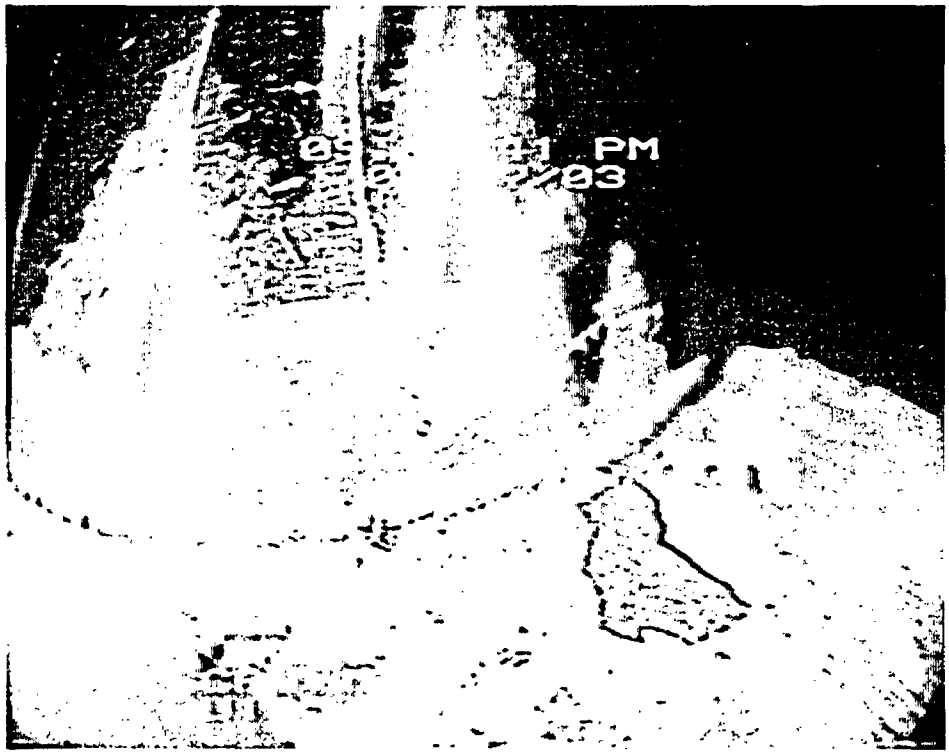

Figure 12: Penetration 28, scan 19. Flaked coating

Figure 13: Penetration 64, scan 10. Boron streaks

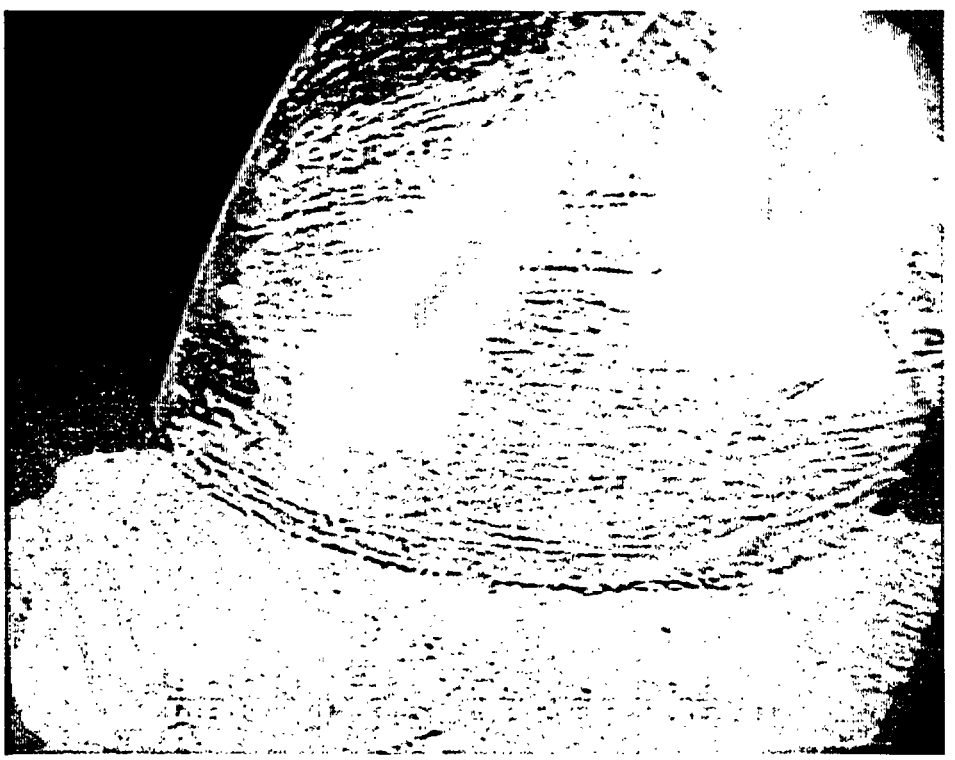

Figure 14: Penetration 64, scan 11. Boron streaks

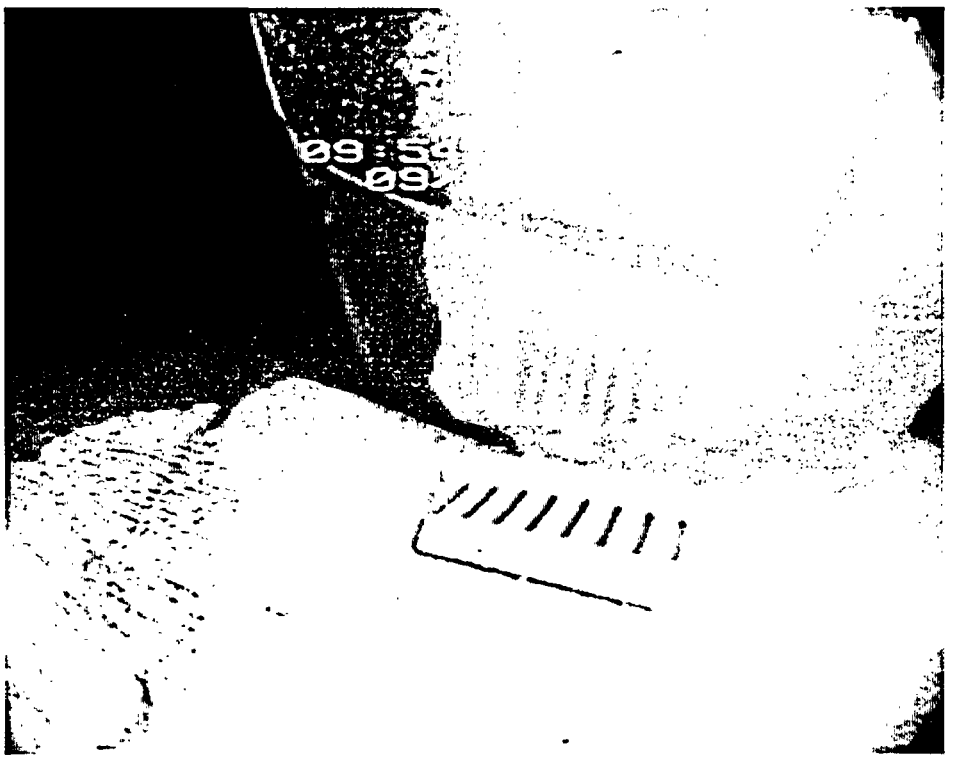

Figure 15: Penetration 63, hose clamp debris

Figure 16: Penetration 63 after debris removal

Figure 17: penetration 67, drill bit tip debris

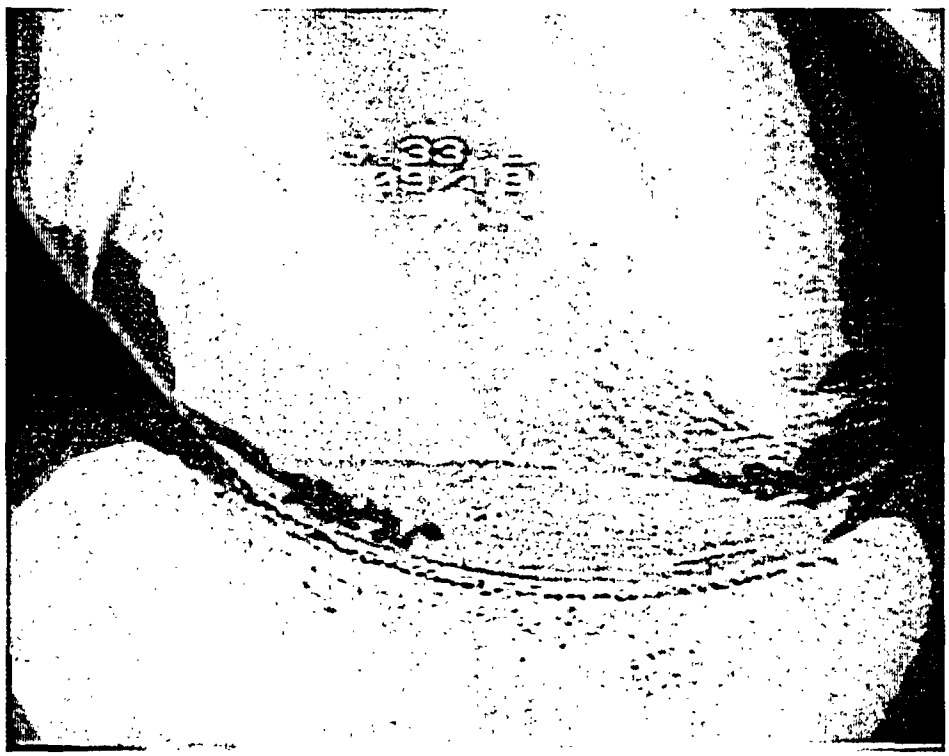

Figure 18: Penetration 67 after debris removal

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TENNESSEE VALLEY AUTHORITY	RECORD OF LIQUID PENETRANT EXAM	REPORT NUMBER R- R0884

PROJECT: WBN UNIT: 1 CYCLE: 5
SYSTEM: 068
WELD/COMPONENT ID: CRDM Nozzle #60
CONFIG.: Pipe TO Pipe
PROCEDURE: N-PT-9 REV. 25 TC
EXAMINATION CODE NA
CODE CLASS: 1 CATEGORY: NA

EXAMINATION DATE 9/19/03
START TIME 6:45 END TIME: 7:20
EXAM SURFACE: ID ○ OD ●
PRESERVICE ⊗ INSERVICE ●
REF. DRAWING NO.: CHM-2684-01

ACCEPTANCE CRITERIA
● N-PT-9 ⊗ APPDX. A ⊗ APPDX. B
● OTHER: Record All relevant Flaws

METHOD OF EXAMINATION

METHOD

WATER-WASHABLE FLUORESCENT DYE: ☐
POST-EMULSIFIABLE FLUORESCENT DYE: ☒
SOLVENT-REMOVABLE FLUORESCENT DYE: ☐
WATER-WASHABLE VISIBLE DYE: ☐
POST-EMULSIFIABLE VISIBLE DYE: ☒
SOLVENT REMOVABLE VISIBLE DYE: ■

PENETRANT MATERIALS

BRAND NAME: Magnaflux
PENETRANT SKL-SP BATCH: ~~00G02K~~ 00D05K
REMOVER: SKC-S BATCH: 03B03K
DEVELOPER: SKD-S2 BATCH: 96J08K

BLACK LIGHT

METER S/N: NA
CAL. DUE DATE: NA

PART TEMP: 79 °F PYROMETER S/N: S22355 CAL. DUE DATE: 7/11/04

EXAMINATION RESULTS SATISFACTORY: ■ UNSATISFACTORY: ☐ NOI NO.: ~~#Xmmt~~ NA

EXPLANATION OF EXAM RESULTS: Increased dwell time to 20 minutes for greater sensitivity. Small axial scratch observed near exam area. Scratch is superficial and did not interfere with exam results.

COMMENTS/LIMITATIONS: Examined 180 degrees in the region of identified boron. No evidence of cracking.

EXAMINER: [signature] LEVEL: III
EXAMINER: N/A LEVEL:
REVIEWER: Larry L Hale LEVEL: II DATE: 9-19-03

ANII: N/A
DATE:
PAGE: OF

Visual Examination Report Summary

INTRODUCTION

During the Watts Bar Unit 1 (WBN-1), Cycle 5 Refueling Outage, remote visual (VT) examinations were performed on the outside surface of the Reactor Pressure Vessel (RPV) Lower Head bottom mounted instrument (BMI) penetrations. TVA Inspection Services Organization (ISO) established a procedure to define the actions required to perform effective VT-2 examinations to detect reactor coolant pressure boundary (RCPB) leakage from the reactor vessel lower head penetrations and the RCPB. The examinations were performed on September 10 and 11, 2003 by Tennessee Valley Authority's (TVA's) Inspection Services Organization (ISO) and R.O.V Technologies. Any suspect areas were also reviewed by a TVA Metallurgical Engineer.

SUMMARY

The examination was implemented through WBN Work Order # 03-002925-000. The examinations were performed in accordance with TVA/ISO NDE procedure N-VT-17, revision 3. The purpose of the VT examinations was to identify any leakage from the instrument penetration annulus area and any degradation of the lower head from RCPB leakage. The annulus area is defined as the intersection between the RPV head and penetration, inclusive of ½ inch of adjacent RPV head base material. The examination included 100% of the RPV head surface and 360 degrees of the annulus. A total of 58 BMI penetrations and the lower head surface were examined. Personnel performing the examinations were certified as VTI LIII. System resolutions checks were required at the initiation and completion of the exam. Any suspected boron leakage areas were to be identified to Materials Engineering for resolution.

TECHNICAL DISCUSSION

Remote VT Equipment

TVA contracted with R.O.V. Technologies to provide remote VT equipment to examine the RPV head penetrations. The work was performed as part of the WBN/ISI program, augmented exam section, of 1-TRI-0-10, revision 10. The remote examinations were performed with a R.O.V. tracked crawler, outfitted with high a resolution color camera having an adjustable LED lighting array, tilt and zoom capabilities. In addition, a stationary camera was used to assist in positional verification.

The data acquisition and crawler control station were located on a platform above the seal table with the associated cabling routed through a panel in the seal table to the RPV lower head. The camera mounted crawler and stationary camera were placed under the head on the insulation surface. Access to the examination area was provided by removing the peripheral insulation panels located below the vessel head. A ladder was placed at one of these openings. The task required confined space monitoring and Radcon support for the initial and subsequent entries into the keyway.

The examinations were recorded on SVHS video cassette's for archival and off-line review. All penetration annulus areas and the head surface in the area on the penetrations were examined and digitally recorded.

Procedure/Documentation

The exam was performed in accordance with TVA/ISO NDE procedure N-VT-17, revision 3. ISO provided two Level III examiners certified in Visual examination to review and evaluate all data on-line.

The visual examination process utilized VT-2 methodology with camera resolution established on characters less than or equal to .105" high, representative of VT-3 sensitivity. (Ref: Section 4, Figure 1)

Examination Process

An examination Scan Plan (Section 3.0) was developed in order to ensure that examinations were performed in a logical sequence, while minimizing radiation exposure and validating positional accuracy.

A total of 15 scan sequences were performed to examine all penetrations. During the examination of each penetration, the head area adjacent to the penetration was also visually examined for boron deposits.

Radiation work permit number 8180 was used for the inspection work.

RESULTS

Bare Head Surface Condition

On nearly all exams, light to moderate staining and surface rust was seen around the annular area and on the bare head surface. These areas had trails from above the bottom head. The condition was not associated with boron leakage from the BMI penetrations. Ref: Section 4: Figures 2, 3, 5, 8, and 9.

There was also an area that exhibited apparent tape residue adjacent to the BMI penetration. Ref: Section 4: Figure 4.

Site Engineering will evaluate the overall condition of the RPV lower head in accordance with the corrosion control program (Ref: WBN PER # 03-016599-000)

Observations

A spun steel material was observed at the majority of the intersections formed by the insulation to BMI tubing. This material was also seen lying loose on the insulation surface. Although it did not present an obstruction, the material itself was a concern and did become entangled in the crawler tracks on three occasions. The material was removed by remote manipulation of the crawler. It is suggested that an evaluation be made to remove this material to prevent possible damage to the remote device. This action would present an opportunity to lessen dose (if manual retrieval was required), lessen outage schedule impact resulting from repair delays and could be a cost savings if replacement equipment was purchased.
Ref: Section 4: Figure 7

Another observation was the "loose parts monitoring" instrument wiring seen at penetrations 24 and 38. The wiring at penetration 24 was loosely bundled and was an obstacle for the crawler. The wiring at penetration 38 was installed tightly against the surfaces and was not an obstacle. It is suggested that an evaluation be made to readjust the material at penetration 24 to prevent a possible obstruction for future exams. WBN Work order # 03-016028-000 was written to address this condition.
Ref: Section 4: Figure 6

CONCLUSION

The VT examinations of all penetrations were found to have no evidence of boron leakage. All penetrations were accessible and all penetrations were examined.

Examination results for each penetration are contained in Section 3.0.

WBN Un. . Cycle 5

RPV Lower Head, Remote Visual Scan Plan

Scan No.	Penetration ID	Location	Tape No.	Tape Count hrs:min:sec	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
1	52	360	1	0:01:55									X	MCW	Exam start
1	43	360	1	0:06:45									X	MCW	
2	55	360	1	0:12:59									X	MCW	
2	36	360	1	0:17:10									X	MCW	
2	40	360	1	0:21:03									X	MCW	
2	49	360	1	0:24:37									X	MCW	
3	45	360	1	0:29:12									X	MCW	
3	32	360	1	0:34:10									X	MCW	
3	24	360	1	0:39:03									X	MCW	Loose parts instr.
3	58	360	1	0:43:24									X	MCW	
4	22	360	1	0:48:00									X	MCW	
4	17	360	1	0:51:44									X	MCW	
4	31	360	1	0:55:29									X	MCW	
5	53	360	1	1:06:32									X	FCL	
5	18	360	1	1:07:45									X	FCL	
5	9	360	1	1:12:10									X	FCL	
5	21	360	1	1:13:31									X	FCL	
5	54	360	1	1:00:30									X	FCL	
6	13	360	1	1:09:27									X	FCL	
6	6	360	1	1:10:47									X	FCL	
6	23	360	1	1:14:23									X	FCL	
7	37	360	1	1:21:13									X	FCL	
7	3	360	1	1:26:01									X	FCL	
7	12	360	1	1:17:08									X	FCL	
7	47	360	1	1:15:47									X	FCL	
8	44	360	1	1:19:27									X	FCL	VT card location
8	25	360	1	1:22:39									X	FCL	
8	10	360	1	1:23:50									X	FCL	
8	1	360	1	1:24:50									X	FCL	
8	5	360	1	1:26:52									X	FCL	
8	15	360	1	1:28:43									X	FCL	

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WBN Un. , Cycle 5
RPV Lower Head, Remote Visual Scan Plan

Scan No.	Penetration ID	Location	Tape No.	Tape Count hrs:min:sec	Debris on Penetration	Debris on Head	Insulation Ring Interference	Boron on CRD (coming from above)	Boron "Streaking" (Horizontal)	Masked (Indeterminate)	Requires Cleaning	Other	NRI	Examiner Initials	Comments
8	27	360	1	1:29:42									X	FCL	
8	35	360	1	1:30:26									X	FCL	
9	16	360	1	1:33:59									X	FCL	
9	2	360	1	1:37:43									X	FCL	
9	7	360	1	1:39:50									X	FCL	Tape residue
9	28	360	1	1:40:58									X	FCL	
10	50	360	1	1:32:06									X	FCL	
10	29	360	1	1:33:24									X	FCL	
10	8	360	1	1:35:12									X	FCL	
10	4	360	1	1:38:15									X	FCL	
10	39	360	1	1:43:14									X	FCL	End of tape 1
11	19	360	2	0:03:18									X	FCL	Start of tape 2
11	11	360	2	0:05:18									X	FCL	
11	20	360	2	0:06:07									X	FCL	
11	33	360	2	0:06:52									X	FCL	
12	48	360	2	0:00:34									X	FCL	
12	41	360	2	0:02:17									X	FCL	
12	14	360	2	0:04:44									X	FCL	
13	26	360	2	0:12:44									X	FCL	
13	30	360	2	0:11:06									X	FCL	
13	42	360	2	0:09:52									X	FCL	
13	57	360	2	0:07:56									X	FCL	
14	56	360	2	0:22:40									X	FCL	End of exam
14	38	360	2	0:20:51									X	FCL	Loose part instr.
14	34	360	2	0:14:05									X	FCL	
15	46	360	2	0:19:12									X	FCL	
15	51	360	2	0:16:42									X	FCL	

Frank Leonard, TVA Level III — 9/11/03 — Date

Matt Welch, TVA Level III — 9/11/03 — Date

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10/05/51

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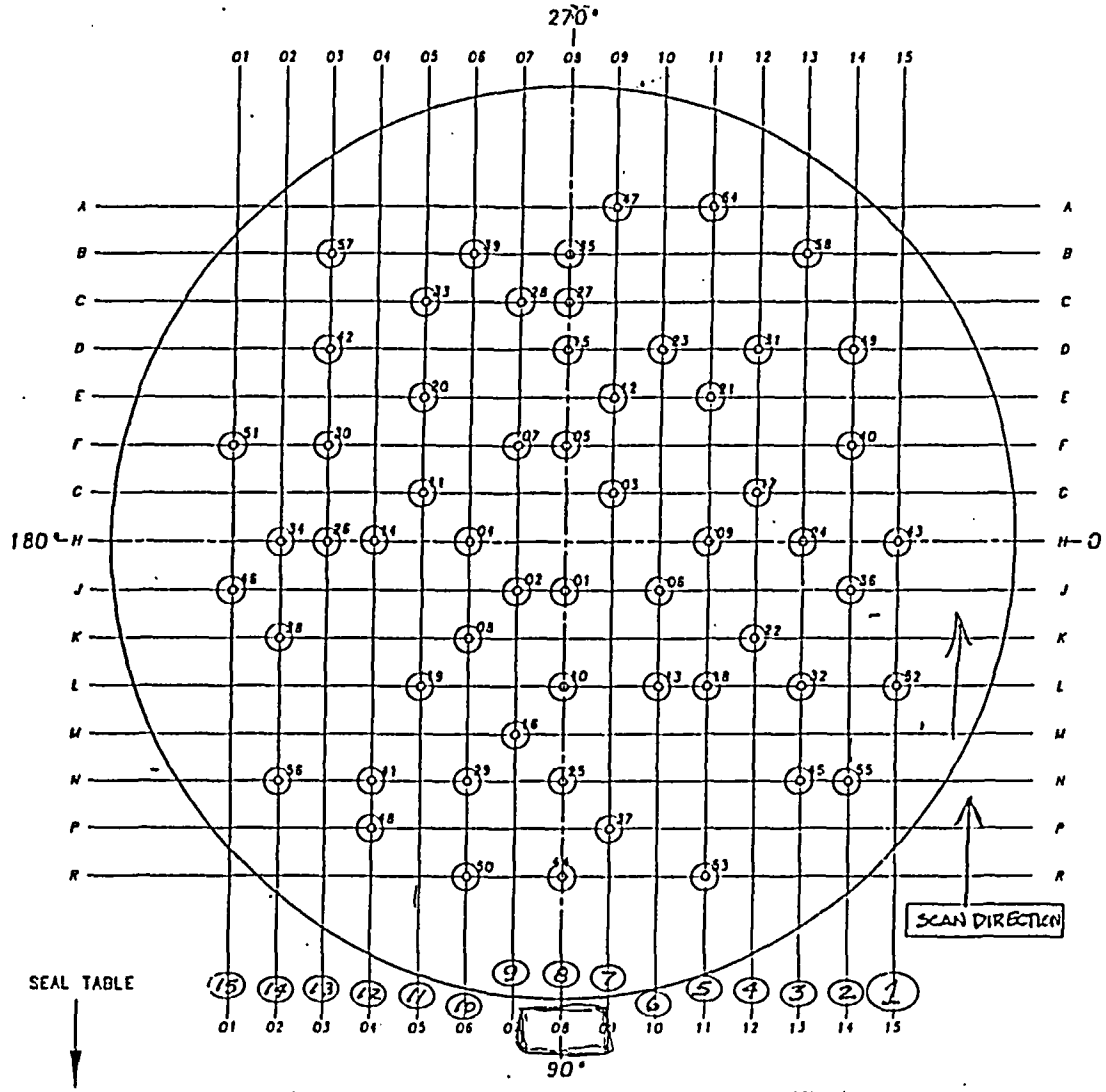

BOTTOM VIEW LOOKING DOWN

REFERENCE DRAWINGS
CONTRACT NO. 21C62-54114-1
WBN-VTM-W120-0070

MATERIAL SPECIFICATIONS
LOWER HEAD
SA-533 GR. B CL. 1
INSTRUMENT TUBES
UPPER PART - ASME SB 166
LOWER PART - SA 182 TYPE 304
ASME CC-1 (EQUIVALENT)

REV	BY	CHECKED	SUBMITTED	APPROVED	DATE

TENNESSEE VALLEY AUTHORITY

WATTS BAR NUCLEAR PLANT
UNIT 1
REACTOR VESSEL BOTTOM HEAD
INTERNAL VIEW PENETRATIONS

DRAWN: PMB	DATE:	SCALE: NOT TO SCALE
CHECKED:	APPROVED:	CAD MAINTAINED DRAWING / REV
SUBMITTED:		1S1-0427-C-08 00

WBN U1C5 RPV LOWER HEAD VISUAL EXAMINATION
SECTION 4 PHOTOS

FIG.1: VISUAL ILLUMINATION CARD USED TO RESOLVE VT-3 CHARACTERS

FIG.2: PENETRATION 28 (VIEW 1) TYPICAL AS FOUND CONDITION

FIG. 3: PENETRATION 28 (VIEW 2) TYPICALAS FOUND CONDITION

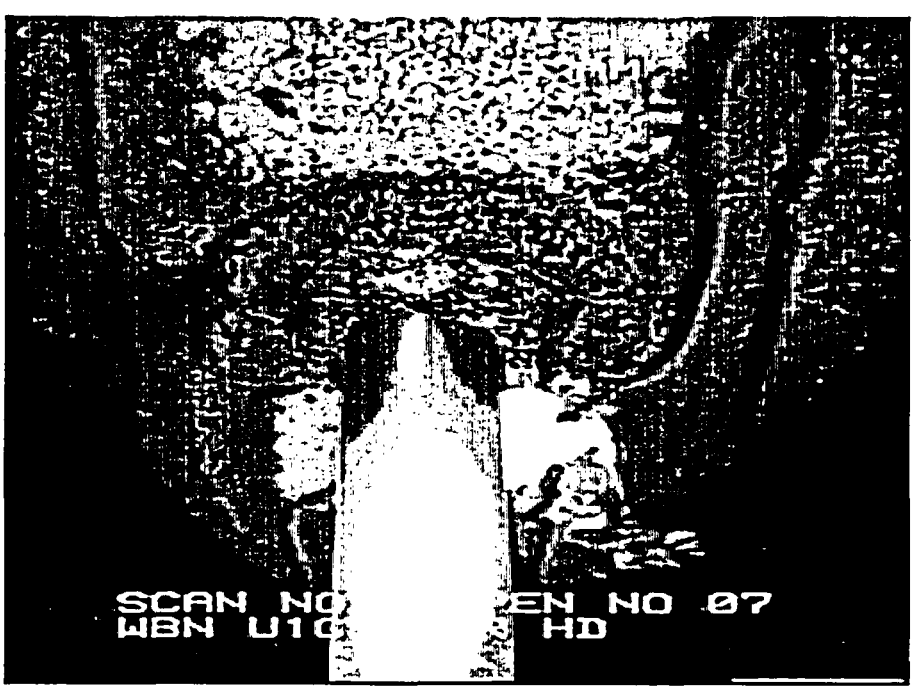

FIG.4-PENETRATION 07: TAPE RESIDUE

FIG. 5: PENETRATION 58. CLOSE UPVIEW OF ANNULAR AREA

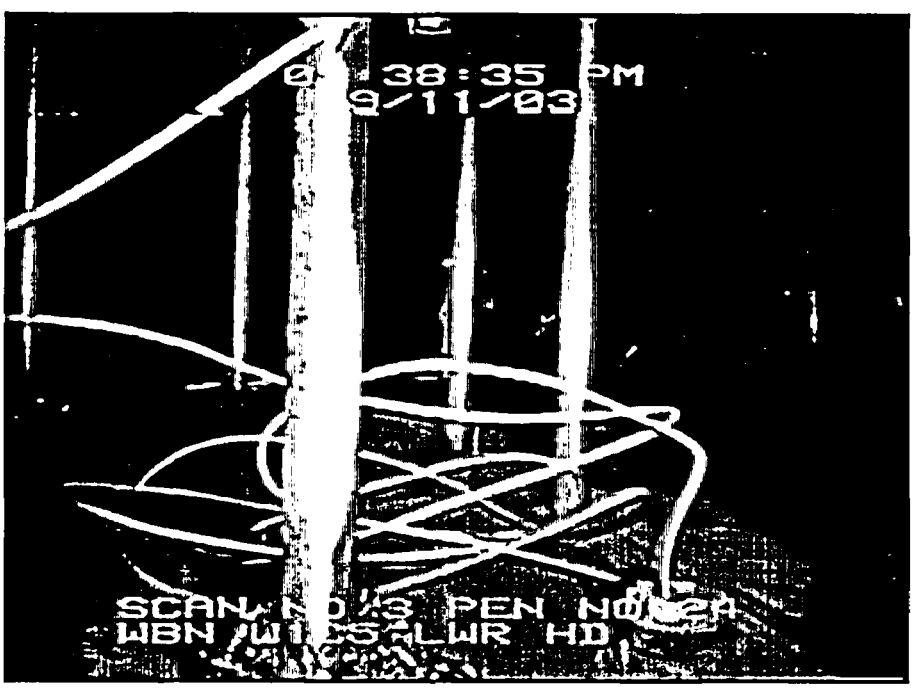

FIG. 6: INSTRUMENTATION WIRINGOBSTICLE IN SCAN PATH AT PENETRATION 24

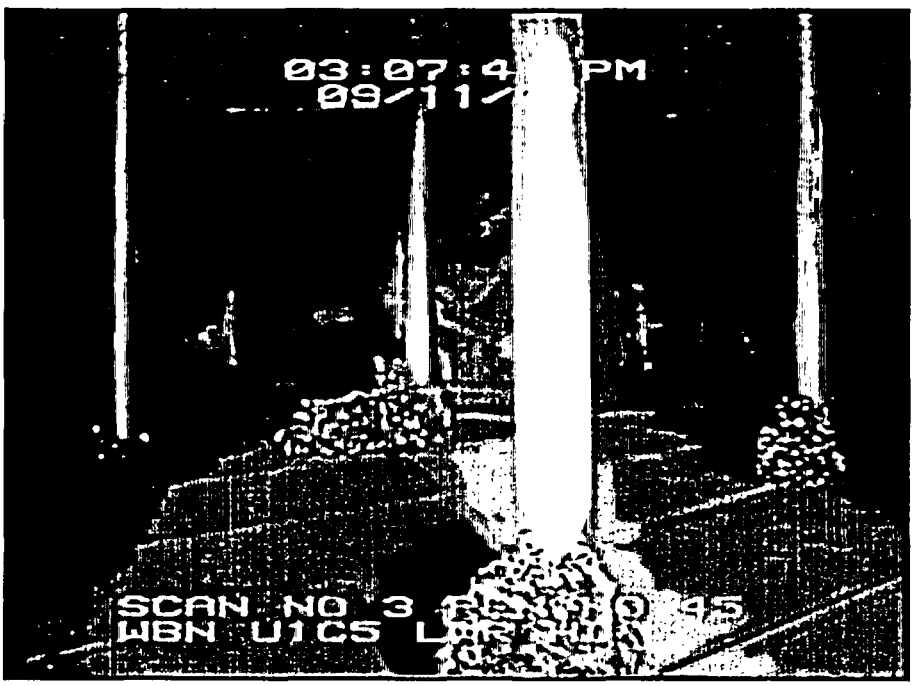

FIG.7: SPUN STEEL MATERIAL AT INSULATION/TUBING JOINTS

FIG.8: GENERAL VIEW OF BARE HEAD CONDITION FROM PEDESTAL CAMERA

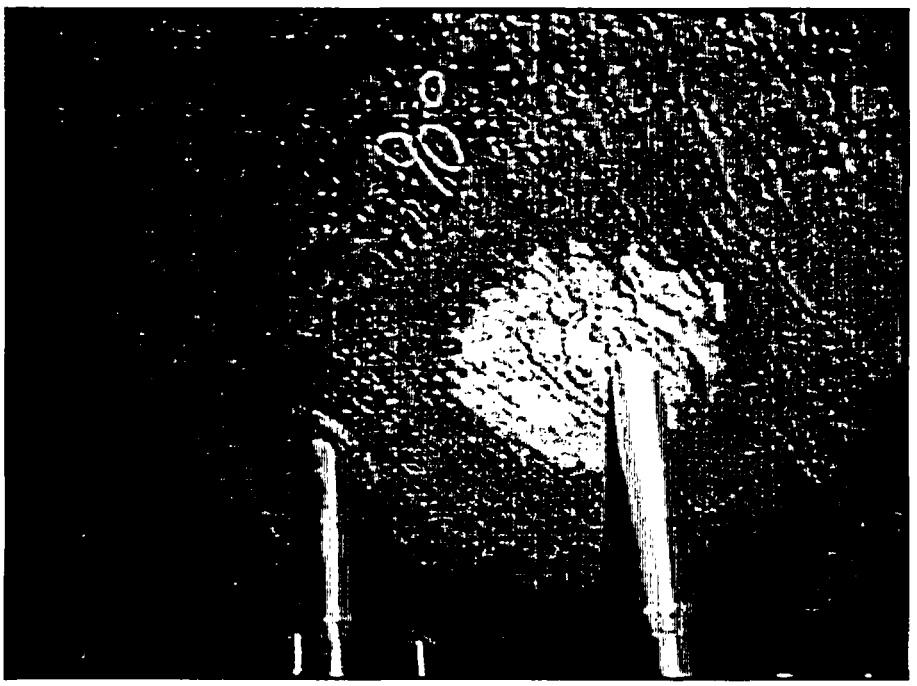

FIG.9: GENERAL VIEW OF BARE HEAD CONDITION FROM PEDESTAL CAMERA

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNIT 1
NRC ORDER EA-03-009 AND BULLETIN 2003-02
REACTOR PRESSURE VESSEL CLOSURE HEAD AND LOWER HEAD INSPECTION
ENGINEERING EVALUATION OF CLOSURE HEAD

ENCLOSURE 2

WATTS BAR NUCLEAR PLANT UNIT 1
NRC ORDER EA-03-009 AND BULLETIN 2003-02
REACTOR PRESSURE VESSEL CLOSURE HEAD AND LOWER HEAD INSPECTION
ENGINEERING EVALUATION OF CLOSURE HEAD

PER 03-016293-000
Reactor Head Examination

Reactor Head Inspection has been completed with one CRDM penetration requiring further evaluation. There was evidence of boron residue on CRDM Penetration #60 below the insulation and on the peripheral CRDM area. PER 03-016293-000 was initiated to document this condition.

WO 03-016329-000 was issued to clean the penetration and the adjacent head area and the penetration was examined by liquid penetrant (N-PT-9) examination on 9/19/03. The head was cleaned and the examination identified no relevant or non-relevant indications. It has been noted that a canopy seal weld leak on this CRDM was identified during RFO1 and was repaired under WO 97-013542-001.

The only other issue associated with the Head Inspection was the identification of a small amount of debris. This debris was removed on 9-19-03.

All Reactor Head Inspection work is complete with only the documentation requiring final review and processing. A formal detailed report of the inspection and findings is in process and is forecast to be completed 10/03/03. These findings and the report will be documented in PER 03-016293-000.

At this time Design Engineering is not aware of and does not have any additional inspections or work scope required to be performed on the Reactor Head during U1C5.

Prepared by: Robert D Briggs Date: 9/20/03

Reviewed by: James S. Robertson Date: 9/20/03

ENCLOSURE 3

WATTS BAR NUCLEAR PLANT UNIT 1
NRC ORDER EA-03-009 AND BULLETIN 2003-02
REACTOR PRESSURE VESSEL CLOSURE HEAD AND LOWER HEAD INSPECTION
ENGINEERING EVALUATION OF LOWER HEAD SURFACE

ENCLOSURE 3

WATTS BAR NUCLEAR PLANT UNIT 1
NRC ORDER EA-03-009 AND BULLETIN 2003-02
REACTOR PRESSURE VESSEL CLOSURE HEAD AND LOWER HEAD INSPECTION
ENGINEERING EVALUATION OF LOWER HEAD SURFACE

PER 03-016599-000

Inspection of Surface Rust on the Unit 1 Reactor Vessel Lower Head

The subject PER documents the presence of rust on the surface of the reactor vessel lower head. This rust was photographed during the remote inspection that was performed on the bottom mounted penetrations. This rust was believed to be tightly adhering, light surface rust based on the photos and video taken during the inspection. A subsequent inspection was performed on 10/12/2003 by Modifications and Design Engineering personnel to determine the extent of the rust on the surface of the lower head.

Two areas, approximately 6" X 6", were selected for cleaning and review. One of the two areas selected contained rust colorations consistent with the majority of the lower head, while the other area was selected because the rust colorations looked heavier in that location. The inspection involved wiping the surface with a damp cloth, removing the substance with a lightly wetted pad of Scotchbrite, and wiping the area a final time with a damp cloth. The two areas cleaned up with minimal effort, and were wiped down to expose the surface of the head. The surface of the lower head was observed to be smooth after cleaning the two areas. The substance was mostly removed during the initial wipe down with the damp cloth. The substance on the lower head is believed to be a combination of light rust and what remains of an initial protective coating. Based upon the ease of removal of the substance, it is determined that there is very little rust on the vessel lower head itself. The substance left a brownish-black, thick residue on the cloth after wiping, which led to the conclusion that there was some of the initial protective coating present. Both areas contained only light rust, and these areas are considered to be representative of the condition on the lower head. This observation is consistent with the determination made during the ROV inspection at the start of the outage. Therefore, no further corrective action will be required.

Cleaning and inspection performed by Tommy Baird, Modifications.

Tommy Baird 10/13/2003

Inspection and Evaluation performed by Robert Kirkpatrick, Mechanical Design.

R Kirkpatrick 10/15/2003